THE TREATMENT OF CORONARY ARTERY DISEASE INCLUDING THROMBOSIS*

(ABSTRACT)**

B. S. OPPENHEIMER
Physician, Mount Sinai Hospital

Introduction: Physicians are regarding with concern the apparent increase in angina pectoris and coronary artery disease, especially as these conditions have incapacitated many of our ablest men and women at the period of their greatest productivity. It is possible that the increase in coronary disease is accounted for by the increased span of life. However, there has also been noted an increase in duodenal ulcer and the psycho-neuroses, and it is possible that the increase in these as well as in angina pectoris is due to another factor, that is the stress and strain of modern life especially in urban communities. The apparent increased clinical incidence of angina pectoris and coronary artery disease has been ascribed to still other factors, such as the more widespread use of tobacco, to errors in diet, to an increased tendency to thrombosis, etc. By the term "angina pectoris" is meant not a clinical entity, but an assemblage of symptoms already enumerated by Dr. Levy, due to a variety of causes, but usually associated with coronary artery disease.

Prophylaxis: Much more may be accomplished at the present time by preventing the onset of this group of disorders than in curing them after the inception of clinical symptoms. The prevention of coronary artery disease is almost identical with the question of the prevention of arterial disease in general. Angina pectoris and coronary artery disease are also found in association with such conditions as arterial hypertension, diabetes, gout, rheumatic

*Delivered October 28, 1931.
**To be published in full. Information may be obtained from author.

valvular disease, polycythemia vera, myxedema, periarteritis nodosa, etc. So the prophylaxis of angina pectoris depends in part on our ability to prevent the onset, progress and complications of these conditions. In some cases of essential hypertension with obesity much may be accomplished by a systematic but safe reduction cure; one often sees a drop in blood pressure paralleling the weight loss. In the management of the diabetic patient it must be the purpose of the treatment not only to avoid such complications as acidosis and coma, but also to control the hyperglycemia and the hypoglycemia, for even the hypoglycemia, usually due to insulin administration, may precipitate an attack of angina pectoris. No practitioner can afford to ignore the rôle which tobacco-smoking appears to play in certain arterial conditions, such as thromboangiitis obliterans. As tobacco undoubtedly plays a rôle in certain cases of angina pectoris, it is really better for all such patients to abstain from smoking at least for a trial period.

There is an *hereditary tendency* and a certain physical *constitution* which predisposes to coronary artery disease. The heredo-familial factor is especially marked among the younger victims of coronary thrombosis. Individuals with a heredo-familial and a personal constitutional predisposition should be earnestly warned to be moderate in all their activities and to watch for such early signs of coronary disease as breathlessness on relatively mild exertion and precordial uneasiness or oppression. If prophylactic measures can postpone the onset of the mischief for a few years, there is reason to believe that the prognosis is improved, for Gross has shown that with advancing years the collateral circulation especially of the left heart becomes more developed, so that closure later in life brings less dire consequences.

It is best to consider first the treatment of angina pectoris, without demonstrable coronary artery occlusion and then the treatment (1) of the acute phase of coronary occlusion, (2) of the interval, (3) of the chronic phase. Of

the chronic phase there are in general two groups of cases:

(a) Those with repeated attacks of angina pectoris.

(b) Those that suffer from chronic myocardial insufficiency frequently due to multiple myocardial infarcts.

The treatment of angina pectoris without demonstrable coronary occlusion: The immediate treatment of such an attack consists of (1) rest, (2) reassurance, (3) one of the vasodilators such as nitroglycerine or amyl nitrite, (4) alcohol, (5) a sedative or opiate. To prevent the recurrence of such attacks the patient's occupation and habits of life should be made less strenuous, and he should be put into the best possible physical and psychic condition. He should avoid smoking, overeating, exposure to cold, overexertion, fear, anger, worry and excitement. Equanimity should be his watchword. The indications for the treatment of any metabolic disturbance, such as diabetes and gout, and for endocrine disturbances, such as hyperthyroidism and myxedema, should be met. The drug treatment during the interval consists of the administration of

(1) One of the xanthine group such as theophylline-ethylene-diamine, theobromine, or theobromine sodium salicylate.
(2) One of the vasodilators.
(3) Such sedatives as codein, phenobarbital, or the bromides.
(4) Small doses of iodides.
(5) Papaverin either alone or in combination.

The treatment of acute coronary artery occlusion, usually thrombosis with cardiac infarction: Morphine is a god-send in such an attack and should be administered in ¼ grain doses, and enough given to obtain relief without endangering the patient's life. As soon as the pain has abated, the morphine is replaced by milder sedatives. After the pain is relieved, and if the patient's condition is poor, it is our custom to give large doses of caffein by day, and to save the sedatives for the night. As soon as

the patient is out of immediate danger, the caffein is replaced by another of the xanthine group. This treatment with strict rest in bed is continued for at least six weeks to avoid the danger of embolism from an intracardiac thrombus and to allow time for the myomalacia to be replaced by connective tissue. After six weeks the physician must use his finest judgment in directing a gradual return to modified activity. The acute stage of occlusion is sometimes marked by attacks of syncope, of pulmonary edema, or of paroxysmal dyspnea, and each of these complications must receive appropriate emergency treatment.

The arrhythmias which may require treatment are auricular fibrillation, auricular flutter, various grades of heart block and paroxysmal tachycardia. Ventricular tachycardia is the most dangerous, and quinidine has proved effective in abolishing this complication, but large doses as recommended by Levine must be administered.

Oxygen administered in a good oxygen tent or preferably in a chamber is apparently of value in the severe cases. The favorable results we have seen have been in those cases which have had pulmonary complications.

During the weeks or months following the acute onset restrictions must not be too readily lifted. During this period the milder sedatives may be used and the fluids restricted to about 1000 c.c. per day. If there is any tendency to nocturnal cardiac dyspnea, or pulmonary edema, the daily fluid intake should be completed by the late afternoon, and an occasional dose of salyrgan (mersalyl) administered.

For purposes of treatment, the cases which pass into the more *chronic* phase may be divided into two groups:

(1) Cases of paroyxsmal cardiac pain, with or without coronary artery occlusion. (It is at times impossible to determine with certainty whether there has or has not been an actual occlusion).

(2) The important group of chronic myocardial insuf-

ficiency, frequently due to multiple myocardial infarcts. (These are the cases so commonly but improperly called "chronic myocarditis").

A variety of methods of treatment have been tried for recurrent attacks of angina, one or other of which may in the future prove to be very valuable. At present they can only be mentioned briefly, as no one of them is uniformly successful.

1. *Tissue extracts*: There have been favorable results reported with the use of each of the following tissue or organ extracts—myoston, myol, myotrat, hormocardiol, lacarnol, carnigan, eutonon, angioxyl, telatutin, padutin or kallikrein.

It is possible that an adenosin-like substance is the potent factor in all these extracts, except in kallikrein which is said to be a complex carbohydrate. Pharmacologically adenosin is a marked dilator of the coronary arteries in all animals so far tested, and therefore theoretically would seem to be indicated under conditions in which the coronary flow can be materially increased. In the one case in which we tried it carefully, it had no demonstrable effect on the pain, but produced a marked sinus block. Some of the other extracts are now being tried in America, as they have been abroad, and one must await the results of these investigations.

2. *Inhalations of carbon dioxide* in the treatment of the early stages of angina pectoris have been used with beneficial results on a very few cases by Yandell Henderson. There will doubtless be further reports on the experimental and clinical results with this method.

3. *Diathermy* appears to be the only physiotherapeutic measure, among the many that are employed in heart disease, which may have a direct influence on the heart. The best results are obtained with those patients in whom the symptoms of angina pectoris appear on exertion and consist only of retrosternal pain or oppression. The value of

diathermy for symptomatic relief cannot be more definitely established until the results with this method are compared with a control series.

4. The treatment of anginal pain by *paravertebral short wave radiation* was first attempted by Groedel in 1923; it has been continued by a group of French observers, and recently by an American. The results so far certainly warrant a continuation of the observations on a larger series of cases followed up for a longer period of time.

5. *Surgical methods*: The fundamental principle for all surgical measures for angina pectoris, whether associated with coronary artery disease or not, has been to interrupt the nervous pathways, usually the afferent sympathetic nerves or ganglia, which conduct the impulses between the heart and central nervous system. It is clear, therefore, that the various surgical procedures which have been tried can be only palliative and give only symptomatic relief, but do not materially change the basic pathologic condition. It is impossible to detail the eight or more surgical procedures on the sympathetic nervous system which have been suggested, or to give the results immediate and ultimate in respect to their effect upon the pain. The recent review by Yater and Trewhella well summarizes the case for and against these operative procedures for angina pectoris as follows:

"The case for this type of treatment is

1. Complete relief of the original pain in 40.5 per cent of cases and partial relief in 27 per cent.
2. Low immediate operative mortality when cases associated with syphilitic aortitis are eliminated.

The case against the operative treatment of angina pectoris is

1. No relief or only partial relief in 53 per cent of cases.
2. Post-operative appearance of annoying paresthesias, Horner's syndrome, new pains or other evil complications in 31 per cent of cases.
3. Effectiveness of amyl nitrite or nitroglycerine for individual attacks of pain is certainly much more than 40.5 per cent of cases.
4. Apparent absence of influence upon the course of the disease."

It must always be remembered that any operative procedure, even a minor one, on a case of coronary disease may result in a fatal issue. For this reason we have discontinued the sympathectomies and now resort to paravertebral alcohol block.

Paravertebral nerve block for angina pectoris was tried out rather extensively by Brunn and Mandl of Vienna with the use of novocaine alone. In 1925 Swetlow introduced a definite improvement on this method by following the novocaine injection by one of 85 per cent alcohol, with the idea of thus producing a Wallerian degeneration and consequently a more prolonged block of the nervous impulses. He identified the nerve roots which should be injected by carefully mapping out the skin areas of hyperesthesia, hyperalgesia and hyperthermesthesia on the surface of the body. After selecting the nerve roots by this procedure he injected first 1 per cent procaine followed by 3 to 5 c.c. of 85 per cent alcohol into the region of the rami communicantes and dorsal roots, as these are the lateral pathways for afferent sensory impulses to reach the spinal cord. It has become evident that paravertebral alcohol block is preferable to sympathectomy both from the standpoint of benefits observed and from a consideration of the dangers involved. Levy and Moore have recently summarized the literature of paravertebral alcohol block, comprising 40 complete cases and adding 9 of their own. They record complete or almost complete relief in 51 per cent of the cases, with some improvement in 34 per cent, and failure in 15 per cent.

Treatment of the chronic phase of coronary artery closure, with myocardial insufficiency: The chief symptoms are dyspnea, paroxysmal nocturnal dyspnea, progressive weakness, retention of water, often loss of weight in spite of this dropsy, enlargement of the liver, and usually not much in the way of anginal pain. The chief complication is the water retention, but with the judicious and adequate use of diuretics, it has been possible to enable many of these patients to maintain their water balance.

When the usual routine measures, i. e. (1) rest in bed, (2) restriction of salt and fluid, and (3) digitalis, have not produced any reduction in the edema, the next step is the choice of one of the following diuretics or a combination of two or more of these:

(1) The purine group
  (a) Caffein
  (b) Theobromine
  (c) Diuretin
  (d) Theophylline
  (e) Theophylline-ethylene-diamine

(2) Salts altering the acid-base balance
  (a) Ammonium chloride
  (b) Ammonium nitrate
  (c) Calcium chloride
  (d) Calcium nitrate

(3) Urea

(4) The mercurial compounds
  (a) Novasurol or Merbaphen
  (b) Salyrgan or Mersalyl
  (c) Novurit
  (d) Neptal

Under continued therapy it has been possible not only to prolong the life of many of these chronic coronary artery cases, but to restore them to a moderately active life.

Summary: In the foregoing discussion on the treatment of coronary artery disease more emphasis has been placed on the *extra-cardiac* factors which may influence the heart, than upon methods of treating the heart directly. Great stress has been laid upon the possible *prevention* of coronary artery disease and associated conditions, especially in instances in which heredo-familial or constitutional factors may predispose to this disorder. After the actual inception of symptoms the importance of relieving the heart of unnecessary effort, both physical and psychic, has been pointed out. A brief review of the various methods of treatment including surgical procedures and paravertebral alcohol block for such cases as have resisted medical

measures, has been given. The chronic type of coronary artery disease and occlusion has been described and it has been noted that the prognosis is not nearly so bad as is commonly believed. The use of modern diuretics has been most helpful in prolonging the lives of those patients who have suffered predominantly from water retention. If these chronic patients live within their capacity and below the threshhold of pain, they can frequently continue at their occupation, especially if this is sedentary, and enjoy years of productive work.